



# AEC-NASA TECH BRIEF



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## Separation of the Rare Earths by Anion-Exchange in the Presence of Lactic Acid

Adsorption of the rare earths and a few other elements to an anion-exchange resin, from mixed solvents containing lactic acid, has been investigated. Tests showed that the lanthanides were absorbed more strongly than from the  $\alpha$ -hydroxyisobutyric acid system, but with less separation between adjacent members of the series.

Earlier studies had shown that the rare earths could be separated by anion-exchange in a lactate medium. Application of the system was limited, however, because of the low adsorption from aqueous solution. Adsorption characteristics of the rare earths in various water-solvent mixtures containing  $\alpha$ -hydroxyisobutyric acid had been reported. Now reported (1) are results of a similar investigation with lactic acid as the complexing agent.

A stock solution of pure lactic acid was prepared. An aqueous solution of the commercial product was neutralized with NaOH and passed through a column of cation-exchanger in the hydrogen form. Adsorption of the rare earths from various solvent mixtures was determined at room temperature (about 23°C) by column elution with AG-Dowex 1×4, 100–200-mesh, anion-exchange resin used in the lactate form. Microgram amounts of a rare-earth mixture were added to an equilibrated column and then eluted with the appropriate solvent mixture. The elution of each element was determined by emission-spectrographic analysis of efficient fractions.

Distribution coefficients were calculated from the expression  $Kd = V/M$ , where  $V$  is the volume (milliliters) that had passed through the column at the elu-

tion-curve peak (corrected for the first volume of interstitial liquid displaced), and  $M$  is the mass of resin in grams.

Results showed that adsorption of the rare earths from lactic acid solutions was greater than that from  $\alpha$ -hydroxyisobutyric acid. Experimental results, showing the variation of distribution coefficients with proportion of aqueous content in methanol mixtures, are summarized.

Distribution coefficients generally increased with the concentration of lactic acid in a solvent mixture, but separation factors between all elements save La were not appreciably affected. A comparison of rare-earth adsorption, in nine different solvents containing a constant proportion of water and lactic acid, is given. Separation of adjacent rare earths was somewhat better in methanol solution than in any of the other solvents tested.

Strontium and barium were not adsorbed from any solvent mixture and could be readily separated from the rare earths. Ferric iron was strongly adsorbed from aqueous solutions of lactic acid.

### Reference:

1. J. P. Faris, "Separation of the rare earths by anion exchange in water-solvent mixtures in the presence of lactic acid" (Argonne National Laboratory, Sept. 1967).

### Notes:

1. This information may interest producers of rare-earth elements.

(continued overleaf)

2. Inquiries concerning this innovation may be directed to:

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Reference: B69-10377

Source: J. P. Faris  
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**Patent status:**

Inquiries concerning rights for commercial use of this innovation may be made to:

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